PATENT COOPERATION TREATY

From the
INTERNATIONAL SEARCHING AUTHORITY

To:
SUSAN M. DADIO
BURNS, DOANE, SWECKER & MATHIS, LLP
P. O. BOX 1404
ALEXANDRIA, VA 22313-1404

PCT

WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY

(PCT Rule 43*bis*.1)

Date of mailing (*day/month/year*)	18 APR 2006
Applicant's or agent's file reference 034136-019	FOR FURTHER ACTION See paragraph 2 below

International application No.	International filing date (*day/month/year*)	Priority date (*day/month/year*)
PCT/US05/10217	25 March 2005 (25.03.2005)	24 March 2004 (24.03.2004)

International Patent Classification (IPC) or both national classification and IPC

IPC: **C10M 125/20**(2006.01),**173/00**(2006.01);**F16C 33/12**(2006.01);**C23F 11/00**(2006.01)
USPC: 508/102,108,114-129;106/14.05-14.45

Applicant

GAUSE, CHARLES B

1. This opinion contains indications relating to the following items:

☒	Box No. I	Basis of the opinion
☐	Box No. II	Priority
☐	Box No. III	Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
☒	Box No. IV	Lack of unity of invention
☒	Box No. V	Reasoned statement under Rule 43*bis*.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
☐	Box No. VI	Certain documents cited
☒	Box No. VII	Certain defects in the international application
☒	Box No. VIII	Certain observations on the international application

2. **FURTHER ACTION**

If a demand for international preliminary examination is made, this opinion will be considered to be a written opinion of the International Preliminary Examining Authority ("IPEA") except that this does not apply where the applicant chooses an Authority other than this one to be the IPEA and the chosen IPEA has notified the International Bureau under Rule 66.1*bis*(*b*) that written opinions of this International Searching Authority will not be so considered.

If this opinion is, as provided above, considered to be a written opinion of the IPEA, the applicant is invited to submit to the IPEA a written reply together, where appropriate, with amendments, before the expiration of 3 months from the date of mailing of Form PCT/ISA/220 or before the expiration of 22 months from the priority date, whichever expires later.

For further options, see Form PCT/ISA/220.

3. For further details, see notes to Form PCT/ISA/220.

Name and mailing address of the ISA/ US	Date of completion of this opinion	Authorized officer
Mail Stop PCT, Attn: ISA/US Commissioner for Patents P.O. Box 1450 Alexandria, Virginia 22313-1450 Facsimile No. (571) 273-3201	23 March 2006 (23.03.2006)	Matthew A. Thexton Telephone No. 571-272-1125

Form PCT/ISA/237 (cover sheet) (April 2005)

WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY

International application No.
PCT/US05/10217

Box No. I Basis of this opinion

1. With regard to the **language**, this opinion has been established on the basis of:

☒ the international application in the language in which it was filed

☐ a translation of the international application into _____, which is the language of a translation furnished for the purposes of international search (Rules 12.3(a) and 23.1(b)).

2. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application and necessary to the claimed invention, this opinion has been established on the basis of:

a. type of material

☐ a sequence listing

☐ table(s) related to the sequence listing

b. format of material

☐ on paper

☐ in electronic form

c. time of filing/furnishing

☐ contained in the international application as filed.

☐ filed together with the international application in electronic form.

☐ furnished subsequently to this Authority for the purposes of search.

3. ☐ In addition, in the case that more than one version or copy of a sequence listing and/or table(s) relating thereto has been filed or furnished, the required statements that the information in the subsequent or additional copies is identical to that in the application as filed or does not go beyond the application as filed, as appropriate, were furnished.

4. Additional comments:

WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY

International application No.
PCT/US05/10217

Box No. IV Lack of unity of invention

1. ☐ In response to the invitation (Form PCT/ISA/206) to pay additional fees the applicant has, within the applicable time limit:
   - ☐ paid additional fees
   - ☐ paid additional fees under protest and, where applicable, the protest fee
   - ☐ paid additional fees under protest but the applicable protest fee was not paid
   - ☐ not paid additional fees
2. ☒ This Authority found that the requirement of unity of invention is not complied with and chose not to invite the applicant to pay additional fees.
3. This Authority considers that the requirement of unity of invention in accordance with Rule 13.1, 13.2 and 13.3 is
   - ☐ complied with
   - ☒ not complied with for the following reasons:

   See the lack of unity section of the International Search Report(Form PCT/ISA/210)

4. Consequently, this opinion has been established in respect of the following parts of the international application:
   - ☐ all parts.
   - ☒ the parts relating to claims Nos. 1-31 and 37-45

WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY

International application No.
PCT/US05/10217

Box No. V Reasoned statement under Rule 43 *bis*.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Claims 5,6,11,12,17,18	YES
	Claims 1-4,7-10,13-16,19-31,38-45	NO
Inventive step (IS)	Claims NONE	YES
	Claims 1-31,37-45	NO
Industrial applicability (IA)	Claims 1-31,37-45	YES
	Claims NONE	NO

2. Citations and explanations:

Claims 1-31 and 37-45 satisfy the criteria set out in PCT Article 33(4), and thus have industrial applicability because the subject matter claimed can be made or used in industry.

Claims 1-4, 7-10, 13-16,19-31, and 37-45 lack novelty under PCT Article 33(2) as being anticipated by Dorn et al. (US 6303760B1). The claims are directed to materials which may be merely TRIMETASPHERE per se. Accordingly, '760 fully anticipates this material (column 6, lines 25-43, examples 1-5); coatings being explicitly suggested. Film is demonstrated (column 3, lines 22-23), which fully anticipates coated articles claimed since such would inherently be "lubricating" "corrosion-resistant" "thermally-conductive" "stable" in air and have "water contact angle" attributable to its nature. Since all matter is "thermally-conductive" claims 41-45 are deemed encompassing TRIMETASPHERE alone or in combination with anything known to mankind.

Claims 5, 6, 11, 12, 17, and 18 lack an inventive step under PCT Article 33(3) as being obvious over the prior art as applied in the immediately preceding paragraph and further in view of Tenne et al. (WO 01/66676A2) and Yamamoto et al. (US 6432887B1). These claims require the further inclusion of another wet or dry lubricant component. '887 discloses that fullerenes have a microbearing effect when employed in standard wet lubricant formulations which further provides anti-seizing benefit at low speeds and low base oil level (column 10, line 59 to column 11, line 8, column 11, lines 36-50). It would have been obvious to the ordinary artisan to employ any of the fullerenes in such combinations given this disclosure, particularly the endohedral metallofullerenes disclosed in '760, with a reasonable expectation of success, thus arriving at the claimed subject matter of claims 6, 12, and 18. '676 discloses (this reference corresponds to US 6710020, cited by Applicant as exemplifying known lubricants, lubricant additives, lubricant coatings, and techniques of making and using) solid, or "dry" lubricants which employ porous metal matrix containing hollow fullerene-like nanoparticles of metal chalcogenide, which are suggested as providing nanoball bearing between sliding surfaces (page 4, lines 18-26 and page 5, lines 12-20. It would have been obvious to the ordinary artisan to employ any material offering a nanoball bearing effect in such combinations given this disclosure, particularly the endohedral metallofullerenes disclosed in '760, with a reasonable expectation of success, thus arriving at the claimed subject matter of claims 5, 6, 11, 12, 17, and 18.

Claims 5, 6, 11, 12, 17, and 18 lack an inventive step under PCT Article 33(3) as being obvious over the prior art as applied in the next to immediately preceding paragraph and further in view of Whewell (US 5269953A). These claims require the further inclusion of another dry lubricant component, such as graphite. '953 discloses lubricant utility (column 2, lines 36-42) for combinations of graphite and "fullerene-encapsulated species" which appear to correspond to endohedral metallofullerenes (column 4, lines 17-53). It would have been obvious to the ordinary artisan to employ any endohedral metallofullerene material in such combinations given this disclosure, particularly the endohedral metallofullerenes disclosed in '760, with a reasonable expectation of success, thus arriving at the claimed subject matter of claims 5, 6, 11, 12, 17, and 18, wherein graphite based lubricants may be dry, or may be combined with conventional oil based lubricants as is well known.

WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY

International application No.

PCT/US05/10217

Box No. VII Certain defects in the international application

The following defects in the form or contents of the international application have been noted:

The description is objected to as containing the following defect(s) under PCT Rule 66.2(a)(iii) in the form or contents thereof: The term TRIMETASPHERE is employed throughout, and vaguely defined at page 4, lines 9-10. The trademark website of the USPTO indicates that this term is subject to a trademark application by Applicant. Further, Applicant's website www.lunananoworks.com/products/trimetaspheres.asp <http://www.lunananoworks.com/products/trimetaspheres.asp> describes TRIMETASPHERE as a trademark and as meaning M3N@C80. Trademarks should be capitalized, and their meaning accurately stated.

The drawings are objected to under PCT Rule 66.2(a)(iii) as containing the following defect(s) in the form or content thereof: Figure 3 employs the term TRIMETASPHERE. Such should be capitalized.

WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY

International application No.
PCT/US05/10217

Box No. VIII Certain observations on the international application

The following observations on the clarity of the claims, description, and drawings or on the questions whether the claims are fully supported by the description, are made:

Claim 5 is objected to under PCT Rule 66.2(a)(v) as lacking clarity under PCT Article 6 because claim 5 is indefinite for the following reason(s): This claim depends from claim 6. It was assumed for examination purposes that the intent was to depend from claim 4.

Claims 2, 8, 14, 20, 26, and 42 are objected to under PCT Rule 66.2(a)(v) as lacking clarity under PCT Article 6 because claims 2, 8, 14, 20, 26, and 42 are indefinite for the following reason(s): The limitation "water contact angle" requires a film or coat of the material in order to be measured, which film or coat does not form a part of the claim as presently written.

Claims 32-36 are objected to as lacking clarity under PCT Rule 66.2(a)(v) because of the claims not fully supported by the description. The description does not disclose the claimed invention in a manner sufficiently clear and complete for the claimed invention to be carried out by a person skilled in the art because: These claims provide for a coating but, this is considered improper form, being indefinite and misdescriptive; a coating is associated with the thing coated; it is no longer a coating once it is stripped or removed. A "coating" per se cannot be patented because it does not exist by itself; once it is removed from that which it coats it ceases to be a coating and becomes a different entity, such as a film/mixture/composition/.../substance/material. One may patent a film/mixture/composition/.../substance/material 'suitable for use as a coating.' Alternatively, one may patent a coated substrate/thing/.../article.

Claims 1-45 are objected to under PCT Rule 66.2(a)(v) as lacking clarity under PCT Article 6 because claims 1-45 are indefinite for the following reason(s): The term TRIMETASPHERE is employed throughout the claims. This is understood to be a trademark of the Applicant. There would not appear to be an undue burden to replace this term with the chemical description.